Serial No. 10/054,826

REMARKS

This amendment is responsive to the Official Action dated December 5, 2003. Claims 1-28 were pending in the application.

No claims were allowed.

No changes have been made to the claims. Accordingly, claims 1-28 are currently pending.

Petition for Extension of Time:

A petition for an extension of the response time from March 5, 2004 to April 5, 2004 is attached.

Information Disclosure Statement:

A PTO form 1449 is enclosed citing a new reference.

Claim Rejections under 35 USC §103:

Claims 1-28 were rejected under 35 USC §103 as being obvious over the US Patent to Jewel USP 5,719,894 in view of the US Patent to Hou et al USP 6,258,615. The Examiner states that Jewel discloses a surface emitting laser comprising a plurality of quantum wells, and that it would have been obvious to combine Hou's alleged teaching of gain independent quantum wells with Jewell '894 to arrive at the claimed invention.

Applicant respectfully disagrees and requests reconsideration.

The Examiner recognizes that Jewell lacks a teaching of gain optimized quantum wells that operate quasi-independently at different temperatures. To fill this void, that Examiner has cited the US Patent to Hou et al No. 6,258,615. However, a detailed reading of the '615 patent will reveal that it does not in fact teach gain optimized quantum wells in a single VCSEL, but rather that it teaches a process for forming an array of vertical cavity resonant structures (emitters or detectors) wherein each individual structure in the array has a different detection or emission wavelength.

There is a clear distinction between a plurality of distinctly optimized quantum wells in a single VCSEL structure and a plurality of different VCSEL structures in an array.

The present invention focuses on obtaining a stable level of emission of a single device at a single wavelength over an extended temperature range without the use of external cooling devices.

In this regard, the present invention describes a VCSEL structure wherein the active region is provided with multiple quantum wells, each having a unique construction optimized to have a peak gain at a wavelength offset from the cavity wavelength for a given temperature. During operating, each quantum well will function independent from the others based on its construction and the junction temperature. Therefore, as the junction temperature increases, the gain peak of each quantum well will independently move from shorter to longer wavelengths relative to the cavity wavelength (See Figs. 1a-1c and 7a).

The essence of the solutions described in our application is composing an active region, which comprises 2 or more quantum wells, separated by barrier layers, such that the gain peaks of the quantum wells are slightly staggered, or offset from each other, in wavelength. Secondary claims in the application then describe the various ways the quantum wells and/or barriers can be engineered to achieve the staggering of the gain peaks. Thereafter, the application also describes how the quantum wells and barriers can be further engineered to compensate for the secondary effect so as to maintain a constant gain over an extended temperature range.

With regard to the '615 patent, there is no disclosure of providing optimized quantum wells that differ within the same vertical cavity structure. The '615 patent focuses on a method of constructing an array having a plurality of vertical cavity structures each of which operates at a different wavelength, such as a detector array, or a VCSEL array for use in WDM transmissions. The entire array of structures is fabricated on a wafer having a single active region. Each structure in the array shares the same active region. Each device is etched on the wafer so as to have a different thickness optical cavity thus resulting in operation at a different wavelength. Typically in this type of array, each device will operate at a different efficiency based on the thickness of the optical cavity at a specific temperature. In other words, at the given operating temperature, each device will operate with a different efficiency,

and therefore, there is only a limited range of temperature in which operation of all of the devices can be achieved. The object of the invention in the '615 patent is to optimize the size of annular masking pattern of each of the vertical cavity structures so that the entire array of structures can operate consistently, i.e. with the same efficiency, at the same temperature. Please refer to Fig. 1 of the '615 patent that illustrates the mask used in carrying out the invention, and shows that the annular mask patterns have differing diameters.

It can thus be appreciated that the '615 patent does not teach optimization of individual quantum wells within a single device to stabilize operation of a single device over an extended temperature range, but rather that it is a teaching of a size variation among vertical cavity structures in an array so that each structure can operate consistently at the same temperature.

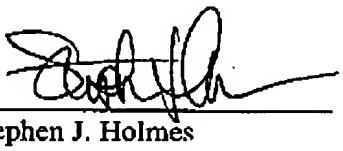
Reconsideration and allowance of claims 1-28 is respectfully solicited.

Accordingly, claims 1-28 are believed to be in condition for allowance and the application ready for issue.

Corresponding action is respectfully solicited.

PTO is authorized to charge any additional fees incurred as a result of the filing hereof or credit any overpayment to our account #02-0900.

Respectfully submitted,



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